CLAIMS

What is claimed is:

1. A method of automatic thermal debonding of workpieces, comprising:

(a) providing a carrier with workpieces that are bonded to the carrier with a thermally activated adhesive;

(b) reactivating the thermally activated adhesive such that the workpieces are movable with respect to the carrier;

(c) aligning a tool with the workpieces;

(d) engaging one of the workpieces with the tool and displacing it from the carrier; and

(e) receiving said one of the workpieces with a detainment mechanism for further processing thereof.

2. The method of claim 1, further comprising the steps of automating accurate and repeatable workpiece placement; controlling temperature and heat flow, and controlling mechanical removal pressure, temporal control, and variability.

3. The method of claim 1, wherein step (d) comprises moving the workpieces with a beveled tooth to individually push the workpieces off of the carrier and place them directly onto the detainment mechanism.

4. The method of claim 1, wherein step (e) comprises receiving the workpieces between a block and a retention feature that is removably mounted to the block.

5. The method of claim 4, further comprising the step of forming the block and retention feature from materials that do not react with either the thermally activated adhesive or the workpieces.

6. The method of claim 4, wherein step (e) comprises pinning each workpiece in the detainment mechanism with a spring-loaded key against the block, and the block has workpiece-separating teeth.

7. The method of claim 1, further comprising realigning the workpieces in the detainment mechanism.

8. The method of claim 1, wherein step (a) comprises providing the workpieces as pico-sized slider rows.

9. The method of claim 1, wherein the workpieces are spaced apart from each other at a first pitch when they are located in the carrier, and the workpieces are spaced apart from each other at a second pitch, that differs from the first pitch, when they are located in the detainment mechanism, and further comprising the step of moving the carrier and the detainment mechanism incrementally relative to each other to facilitate alignment therebetween.

10. A method of automatic thermal debonding of workpieces, comprising:

(a) providing a carrier with workpieces that are bonded to the carrier with a thermally activated adhesive;

(b) reactivating the thermally activated adhesive such that the workpieces are movable with respect to the carrier;

(c) aligning a tool with individual ones of the workpieces;

(d) engaging said individual ones of the workpieces with the tool and displacing them from the carrier;

(e) receiving said individual ones of the workpieces with a detainment mechanism for further processing thereof by receiving the workpieces between a block and a retention feature that is removably mounted to the block;

(f) realigning the workpieces in the detainment mechanism; and

(g) automating accurate and repeatable workpiece placement; controlling temperature and heat flow, and controlling mechanical removal pressure, temporal control, and variability.

11. The method of claim 10, wherein step (d) comprises moving the workpieces with a beveled tooth to individually push the workpieces off of the carrier and place them directly onto the detainment mechanism.

12. The method of claim 10, further comprising the step of forming the block and retention feature from materials that do not react with either the thermally activated adhesive or the workpieces.

13. The method of claim 10, wherein step (e) comprises pinning each workpiece in the detainment mechanism with a spring-loaded key against the block, and the block has workpiece-separating teeth.

14. The method of claim 10, wherein step (a) comprises providing the workpieces as pico-sized slider rows.

15. The method of claim 10, wherein the workpieces are spaced apart from each other at a first pitch when they are located in the carrier, and the workpieces are spaced apart from each other at a second pitch, that differs from the first pitch, when they are located in the detainment mechanism, and further comprising the step of moving the carrier and the detainment mechanism incrementally relative to each other to facilitate alignment therebetween.

16. A method of automatic thermal debonding of workpieces, comprising:

(a) providing a carrier with workpieces that are bonded to the carrier with a thermally activated adhesive;

(b) reactivating the thermally activated adhesive such that the workpieces are movable with respect to the carrier;

(c) aligning a tool with individual ones of the workpieces;

(d) engaging said individual ones of the workpieces with the tool and displacing them from the carrier;

(e) receiving said individual ones of the workpieces with a detainment mechanism for further processing thereof by receiving the workpieces between a block and a retention feature that is removably mounted to the block;

(f) realigning the workpieces in the detainment mechanism; and

(g) automating accurate and repeatable workpiece placement; controlling temperature and heat flow, and controlling mechanical removal pressure, temporal control, and variability, such that the workpieces are spaced apart from each other at a first pitch when they are located in the carrier, and the workpieces are spaced apart from each other at a second pitch, that differs from the first pitch, when they are located in the detainment mechanism, and moving the carrier and the detainment mechanism incrementally relative to each other to facilitate alignment therebetween.

17. The method of claim 16, wherein step (d) comprises moving the workpieces with a beveled tooth to individually push the workpieces off of the carrier and place them directly onto the detainment mechanism.

18. The method of claim 16, further comprising the step of forming the block and retention feature from materials that do not react with either the thermally activated adhesive or the workpieces.

19. The method of claim 16, wherein step (e) comprises pinning each workpiece in the detainment mechanism with a spring-loaded key against the block, and the block has workpiece-separating teeth.

20. The method of claim 16, wherein step (a) comprises providing the workpieces as pico-sized slider rows.